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AUTHOR Murphy, Cheryl A.; Walls, Richard T.
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ABSTRACT

Teacher enthusiasm has been linked to increased student achievement and attentiveness. Although enthusiasm is often mentioned to teachers and preservice teachers as being important, they are rarely trained in the particulars of enthusiastic teaching. This investigation was designed to explicate relationships among enthusiasm behaviors in a natural classroom setting. Subjects, four outstanding instructors from West Virginia University, were filmed during two class sessions for 30 minutes each to assess 5 enthusiasm behaviors (eye contact, facial expression, vocalization, gestures, and movement). The presence or absence of these behaviors was scored in 10-second snapshots divided into 2-second intervals for each minute. Concurrent and sequential relations of the enthusiasm behaviors were established by determining which behaviors consistently occurred simultaneously or preceded other enthusiasm behaviors. The results revealed strong concurrent dependencies and sequential dependencies consistently used by these outstanding teachers. Findings may have implications for teacher training and research on the construct of teacher enthusiasm. (Contains 23 references.) (Author/LL)

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Concurrent and Sequential Occurrences of Teacher Enthusiasm Behaviors

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Cheryl A. Murphy &
Richard T. Walls
West Virginia University

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Abstract

Teacher enthusiasm has been linked to increased student achievement and attentiveness and is worthy of a more in-depth content analysis than it has received to date. Four outstanding university instructors were filmed during two class sessions for 30 minutes each to assess five enthusiasm behaviors (eye contact, facial expression, vocalization, gestures, and movement). The presence or absence of these behaviors was scored in 10-second snapshots divided into 2-second intervals for each minute. Concurrent and sequential relations of the enthusiasm behaviors were established by determining which behaviors consistently occurred simultaneously or preceded other enthusiasm behaviors. The results revealed strong concurrent dependencies and sequential dependencies consistently used by these outstanding teachers. The findings may have implications for teacher training and research on the construct of teacher enthusiasm.

Concurrent and Sequential Occurrences of Teacher Enthusiasm Behaviors

One instructor characteristic related to learning is enthusiasm (Coats & Smidchens, 1966; Weaver & Gotrell, 1987). Rosenshine (1979) stated that teacher enthusiasm has long been believed to be an important teacher behavior, and according to Bettencourt, Gillett, Gall, & Hull (1983), it is now considered to be one of the most important characteristics of effective teachers. In their review of process-product studies, Rosenshine and Furst (1973) listed enthusiasm as one of the five strongest variables in consistenly influencing student achievement. Enthusiasm has been cited as an important teacher behavior in Brophy and Good's (1986) review.

Attempts have been made to identify teacher behaviors that convey the impression of enthusiasm and to develop instruments to measure overt enthusiasm. Caruso (1982) concluded that teacher enthusiasm is not defined by a single behavior but rather a group of teaching behaviors. Collins (1976) defined teacher enthusiasm as a composite of eight observable behaviors: vocal delivery, eye movements, gestures, movements, facial expressions, word selection, acceptance of ideas and feelings, and an overall energy. These behaviors were used as a measurement device for enthusiasm by Bettencourt, et al. (1983), Brigham (1991), and Streeter (1986). Others have used slight variations of the Collins (1976) definition.

Enthusiasm was defined as differences in expressiveness, vocal inflection, friendliness, charisma, humor, and personality by Ware and Williams (1977). It was defined as rapid or excited speech, many changes in voice tone or pitch, shining eyes, raised eyebrows, quick and demonstrative movements of the body and face, vibrant facial expressions, and a high overall energy level by McKinney, Larkin, and Burts (1984). Payne and Manning (1986) defined enthusiasm as accepting feelings, praise or encouragement, using student ideas, asking questions, and giving directions. Wineburgh (1990) used facial expressions, gestures, and vocal inflections to define enthusiasm. Weaver and Cotrell (1987) deviated from the typical Collins-type list and defined teacher enthusiasm as the amount of aggressiveness, boldness, forcefulness, demonstration of an active commitment to the topic, and the amount of intellectual and physical power exhibited by the teacher. The patterns of behaviors that have been included in studies conducted on teacher enthusiasm are illustrated in Table 1. In that table, some of the exact behaviors have been condensed, abbreviated, or placed with other behaviors that were similar in nature.

Insert Table 1 about here

Another approach has been the use of rating scales in attempts to measure overall enthusiasm. Statements which have been used

included , "Level of enthusiasm while teaching is high" (McEwing, 1981), "Maintained high levels of enthusiasm" and "Overall enthusiasm was good" (Overall & Cooper, 1981), "Enthusiasm was high" (Banz & Rodgers, 1985), "Teacher is enthusiastic" (Waxman & Eash, 1983), and "Enthusiasm or interest expressed by the teacher during nursery school activities" (Briggs & Dickerscheid, 1985). The Teacher Behaviors Inventory (Murray, 1983) consisted of 60 items, including (a) speaks expressively or emphatically, (b) moves about while lecturing, (c) gestures with hands and arms, (d) avoids eye contact with students, (e) smiles or laughs, and (f) shows facial expressions. In these studies, trained observers were used to rate the level of enthusiasm on the scales provided (Bettencourt et al., 1983; Briggs & Dickerscheid, 1985; Brigham, 1991; McEwing, 1981; Murray, 1983; Streeter, 1986), or students were used to rate the level of teacher enthusiasm, or teacher immediacy, on scales provided (Banz & Rodgers, 1985; Frymier, 1992; Overall & Cooper, 1981; Payne & Manning, 1986; Ware & Williams, 1977; Waxman & Eash, 1983).

In an investigation involving 1,300 university undergraduates, students indicated that enthusiasm is a preferred trait that helps to characterize the ideal teacher (Rice, 1990), and more enthusiastic teachers have been seen as fostering a more positive and pleasant classroom environment by students (Payne & Manning, 1986). Students were also found to have more positive attitudes toward reading on a post-test after their teacher had received enthusiasm

training (Streeter, 1986). Similarly, Wineburgh (1990) reported that kindergarten students who were read to with enthusiasm interacted more with the reader and were more attentive, while the students who were read to lethargically appeared restless and bored, and had little interaction. Bettencourt et al. (1983), as well as Brigham (1991), found that students taught by enthusiastic teachers increased their on-task seatwork behavior significantly, while students taught by less enthusiastic teachers declined in their on-task seatwork behavior. Brigham (1991) also found that students with learning disabilities appear to be more interested in their lessons when teachers are enthusiastic.

Waxman and Eash (1983) found enthusiastic teaching to be a significant predictor of a student's academic achievement in the younger grades. Brigham (1991) also reported teacher enthusiasm to be a significant predictor of achievement, with students scoring substantially higher after receiving enthusiastic teaching than when they received less enthusiastic teaching. Rosenshine and Furst (1973) stated, "Significant results relating enthusiasm to student achievement on at least one criterion measure were obtained in all five studies in which the variable was studied..." (p. 46). No differences in student achievement attributable to enthusiastic teaching were detected by McKinney et al. (1984) or Wineburgh (1990).

Although enthusiasm is often mentioned to teachers and pre-service teachers as being important, they are rarely trained in the

particulars of enthusiastic teaching. Some research indicates, however, that teachers may be trained to exude enthusiasm behaviors (Bettencourt et al., 1983; Streeter, 1986; Ware & Williams, 1977). Video taping of teaching sequences has been useful in such training efforts. The topic of teacher enthusiasm is worthy of a more extensive content analysis than it has received to date. The present research was designed to give attention to aspects of concurrent and sequential behaviors that may contribute to teacher enthusiasm. It was proposed that , during exceptional teaching , some of the enthusiasm behaviors occur concurrently (simultaneously). Secondly, sequential occurrences should be evident in which some enthusiasm behaviors consistently precede or follow the occurrence of other particular enthusiasm behaviors. Thus, the questions to be answered were the following. Will any of the five enthusiasm behaviors (eye contact, facial expressions, vocalization, gestures, and movements) consistently occur simultaneously with any of the remaining enthusiasm behaviors, and will any of the five enthusiasm behaviors consistently precede or follow any of the remaining enthusiasm behaviors during instruction performed by exceptional teachers?

Method

Subjects

The subjects were four instructors from West Virginia University. These instructors were recipients of outstanding teaching awards and were chosen for this investigation because they had earned

these awards, which signify that they have been considered exceptional teachers. They volunteered to participate and indicated a willingness to be videotaped during two of their regularly scheduled class sessions.

Operational Definitions of Enthusiasm Behaviors

The enthusiasm behaviors were defined in terms of observable responses that could be coded reliably by independent observers (at least 80%). The following were the definitions used by the observers in scoring the teaching sequences of the four subjects. If the defined behavior occurred (began or was maintained from a previous two-second interval), it was scored as a check. Otherwise, it was left blank.

(a) Eye contact (EC) was defined as the subject focusing his or her eyes at the approximate eye level of his or her students. (b) A facial expression (FE) was defined as a discernible distortion of the subject's face that is not caused by vocal delivery or involuntary responses (e.g., sneezing, coughing). A distortion from the instructor's normal facial expression might be squinting, arched or raised eyebrows, lip pursing, smile, wink, frown, grimace, scowl, showing of teeth, sticking out of tongue, wrinkled nose, or dropped jaw. (c) Vocalization (V) was defined as the presence of speech. Fillers such as "um" and "aah" were not considered speech. (d) A gesture (G) was defined as a movement of the hands, body, or head to emphasize or accentuate a response (behavior) by the subject. It was a discernible departure from the subject's normal stance or walk. (e) A movement

(M) was defined as the subject walking or traveling with the use of the legs.

Procedure

The investigation was designed to explicate relationships among enthusiasm behaviors in a natural classroom setting. To describe these simultaneous and sequential occurrences among the five enthusiasm behaviors, it was necessary to videotape normal classroom procedures and the instructor's naturally occurring teaching styles or methods. Equipment for the investigation consisted of a VHS Panasonic camcorder with a continuous clock feature, four VHS two-hour tapes, a tripod, a sony VCR, and a stopwatch.

Each of the four instructors was videotaped during two 30-minute sessions. Recording times were scheduled for regular class sessions during which a quiz or test was not scheduled. Thus, these scheduled sessions were for classes in which the instructor was actively involved in instruction. The two sessions for each instructor were scheduled at the instructor's convenience with no requirement of a particular number of intervening days between the two sessions. The two sessions for a given instructor, however, were videotaped within the same university course. The object of the taping was to obtain two 30-minute segments that would allow for scoring of the five enthusiasm behaviors.

Scoring required the tapes to be viewed a number of times. The continuous clock feature on the camcorder and the use of a stopwatch

allowed the observers to view the tapes and record data in the appropriate time blocks. It was necessary that the events be tied to the particular time during the teaching sequence so that concurrent and sequential occurrences among enthusiasm behaviors could be established.

Scoring occurred in 10-second snapshots. The first 10 seconds of each minute within a 30-minute segment were scored. Thus, there were 60 10-second snapshots of each subject's teaching behavior (30 for day 1, 30 for day 2). The 10-second snapshot was divided into 2-second intervals as illustrated in Table 2. The definitions of the five enthusiasm behaviors relate to these 2-second intervals within the 10-second snapshots found in the 30-minute segments.

Insert Table 2 about here

To illustrate the scoring, the following example is provided and represented in Table 2. It may be seen that the 10-second snapshot included the five enthusiasm behaviors scored for five 2-second intervals. Eye contact (EC) occurred (began or was maintained from a previous 2-second interval) in the first, second, and third 2-second intervals. Facial expression (FE) occurred (began or was maintained from a previous interval) in the second, third, fourth, and fifth 2-second intervals. Vocalization (V) occurred (a word was uttered) in the third, fourth, and fifth 2-second intervals. Gestures (G) occurred (began or

was maintained from a previous interval) in the third and fourth 2-second intervals. Movement (M) did not occur in any of the 2-second intervals. This pattern is evident in Table 2. Scoring thus included 60 10-second snapshots, such as the one illustrated, for each of the four subjects (240 snapshots). Interobserver reliability procedures leading to percentages of agreement are reported in the Results section.

Results

The first research question concerned the simultaneous occurrence of enthusiasm behaviors in teaching. The second research question was directed toward determining sequential occurrences for these behaviors.

Concurrent Occurrences of Enthusiasm Behaviors

A concurrent occurrence was defined as two or more enthusiasm behaviors occurring in the same 2-second interval of a snapshot. The scoring of concurrent occurrences may be illustrated by reference to the 10-second snapshot in Table 2. In that table, only EC occurred during the first 2-second interval. Consequently, no concurrent occurrences were recorded. EC and FE occurred simultaneously in the second 2-second interval and was counted as one instance of a concurrent occurrence (EC-FE). In the third 2-second interval, EC, FE, V, and G occurred simultaneously. Thus, in the third 2-second interval, the 11 concurrent occurrences were (1) EC-FE, (2) EC-V, (3) EC-G, (4) FE-V, (5) FE-G, (6) V-G, (7) EC-FE-V, (8) EC-FE-G, (9) EC-V-G, (10) FE-V-G, and (11) EC-FE-V-G. In the fourth 2-second interval, FE, V, and G

occurred. Thus, the four concurrent occurrences were (1) FE-V, (2) FE-G, (3) V-G, and (4) FE-V-G. In the fifth 2-second interval, FE and V occurred simultaneously and was counted as one concurrent occurrence (FE-V).

The frequencies of concurrent occurrences among enthusiasm behaviors for the four subjects on each day are tabulated in Table 3. In addition, totals and percentages are provided that represent overall counts. The column of Table 3 for Totals Low Count contains the ratios of the number of times the combination of behaviors occurred to the total number of times it could have occurred (based on the behavior with the lowest frequency per day in that combination of behaviors). For example, if EC occurred 30 times in day one and 20 times in day two, and V occurred 20 times in day one and 30 times in day two, the highest possible total for EC-V for the two days would be 40. This is because V could be no more than 20 on day one (limiting EC-V to 20 for that day), and EC could be no more than 20 on day two (limiting EC-V to 20 for that day). Therefore, the behavior with the lowest frequency in the combination per day was used to determine the highest possible total for the combination overall. Percentages Based on Low Count were calculated from the ratios in the Totals Low Count column, while Percentages Based on 1200 Total Intervals were calculated by dividing the number of times the combination of behaviors occurred by the total number of intervals (1200).

Insert Table 3 about here

Examination of Table 3 reveals the following results when two enthusiasm behaviors occur together. EC-V occurred together 868 times. This indicates that there was a great deal of concurrent occurrence between eye contact and vocalization in two respects. First, if these two behaviors had occurred together in every 2-second interval for each subject in every snapshot, there would have been 1200 instances of EC-V. Thus, 868 simultaneous occurrences of EC-V out of 1200 maximum snapshot intervals represents dominance of this pattern. Second, based on the number of occurrences of the lesser of the two behaviors scored on a daily basis (Totals Low Count), EC-V could only have occurred 904 times, and 868/904 represents a 96% ratio.

The strongest concurrent two-behavior combinations following EC-V based on the 1200 total intervals were (2) V-G, (3) EC-G, (4) V-M, (5) EC-M, and (6) G-M, respectively. The five most prevalent concurrent two-behavior combinations based on the total number of times they could have occurred according to low counts per day (Totals Low Count) were (1) V-G, (2) FE-V, (3) EC-FE, (4) EC-V, and (5) EC-G, respectively. Taking these two measures together, the highest scoring two-behavior combinations were (1) V-G, (2) EC-V, and (3) EC-G.

When three enthusiasm behaviors occurred together, the results revealed that EC-V-G was the most dominant combination with a

Percentage Based on Low Count of 88%, and a Percentage Based on 1200 Total Intervals of 59%. The most prevalent three-behavior combinations based on the 1200 total intervals were (1) EC-V-G, (2) V-G-M, and (3) EC-G-M. The strongest concurrent three-behavior combinations based on the total number of times they could have occurred according to low counts per day were (1) EC-FE-V, (2) EC-V-G, and (3) EC-FE-G, respectively.

The four and five enthusiasm behavior combinations revealed that EC-V-G-M contained the highest Percentage Based on 1200 Total Intervals (29.6%), and the second highest Percentage Based on Low Count (60%). EC-FE-V-G scored the highest Percentage Based on Low Count per day with 149/183 (81.4%). This indicates that the combination is also a prevalent one. The remaining four and five concurrent combinations yielded fairly low results.

At the bottom of Table 3 are totals and percentages of the individual behaviors based on the 1200 total intervals possible. From this, the reader can see that vocalization was the most dominant behavior (90.9%), followed by eye contact (76.5%), gestures (66.5%), movement (55.8%), and facial expression (15.2%). Likewise, the five individual enthusiasm behaviors were tallied for each subject. There was substantial consistency across the four subjects with vocalization having the highest count for three of the four and a close second for Subject 4. Facial expression was last for all subjects.

Sequential Occurrences of Enthusiasm Behaviors

A sequential occurrence was defined as one or more enthusiasm behaviors immediately preceding the initiation (start) of another enthusiasm behavior (focus behavior). Initiation could not be determined during the first 2-second interval because the behaivor may have been initiated prior to that interval. Therefore, behaviors that occurred during the first 2-second interval were not considered initiated (focus) behaviors although they could precede a focus behavior. The scoring of sequential occurrences may be illustrated by reference to the 10-second snapshot in Table 2. In that table, EC and M were never initiated (started). Consequently, no sequential occurrences were scored with EC or M as focus behaviors. FE was initiated in the second 2-second interval, and the preceding behavior was EC. Therefore, a sequential occurrence exists and is scored where EC precedes FE. V and G are initiated during the third 2-second interval with EC and FE immediately preceding them. Thus, two sequential occurrences exist where EC-FE precedes V, and EC-FE precedes G. There are no further sequential occurrences in this snapshot because no behaviors were initiated (started) in the fourth or fifth 2-second intervals.

The frequencies of sequential occurrences among enthusiasm behaviors for the four subjects are tabulated in Table 4. In addition, the Totals Ratio compares the total number of sequential occurrences per combination to the total number of initiations of that focus behavior. For example, EC preceded by V occurred 19 times while EC

(the focus behavior) was initiated 79 times, yielding a Totals Ratio of 19/79. Percentages were calculated from these ratios.

Insert Table 4 about here

The most dominant sequential occurrence according to a simple raw count occurred when EC-V-G preceded M with a total of 48 sequential occurrences. The strongest sequential occurrences after EC-V-G preceding M are (2) EC-V-G-M preceding FE with 35, (3) EC-V-G preceding FE with 32, (4) V preceding M with 26, and (5) EC-V-M preceding G with 23, respectively.

When the Totals Ratio and accompanying Percentage column of Table 4 are considered, the most prevalent sequential combination occurred when EC-V-G precedes M with 48/125 (38.4%). The next most dominant sequential occurrences occurred when EC-V-G-M preceded FE 35/100 (35%), EC-M preceded V 16/48 (33.3%), EC-V-G preceded FE 32/100 (32%), V-G-M preceded EC 22/79 (27.8%), EC-V-M preceded G 23/84 (27.3%), and EC-V preceded G 22/84 (26.1%).

Thus, whether analyzing the results by raw count or in ratio form, EC-V-G preceding M is the most dominant sequential occurrence. Likewise, EC-V-G-M preceding FE, EC-V-G preceding FE, and EC-V-M, preceding G are prevalent during both forms of analysis. It should also be noted that a pattern appears in which EC and V are present in all of the predecessors in the dominant combinations.

Interobserver Reliability

Interobserver reliability was established by having a second observer score 40 snapshots, 10 from each subject's teaching sequences (five from day 1, five from day 2). A table of random numbers was used to determine whether the 5 snapshots per day were taken from the beginning, middle, or end of the 30 minute taping session. This method ensured that each instructor's tape was included in the interobserver reliability scoring and that the 5 snapshots per day were randomly chosen . A minimum criterion of 80% agreement on each of the five enthusiasm behaviors was considered necessary for acceptance of the data. Initial practice on parts of tapes not involved in the reliability scoring were used to orient the reliability observer to the definitions and scoring practices. Agreements and disagreements within each 10-second snapshot allowed for point-to-point correspondence in reliability scoring. This was desirable so that precise discrepancies within the 10-second snapshots would be detected (Miller, 1980). Demonstration of reliable scoring was accomplished through inter-observer agreements of 86% for Subject One, 91% for Subject Two, 92% for Subject Three, 84% for Subject Four, and 88% overall.

Discussion

This investigation may be distinguished from past research which incorporated the use of rating scales or examined the specific presence or absence of component behaviors of enthusiasm. The

present work was accomplished by examining considerably shorter intervals (2 seconds), allowing for analysis of the specific component parts of enthusiasm in relation to each other at specific points in time. This was crucial in discovering concurrent and sequential occurrences among the individual enthusiasm behaviors that outstanding teachers demonstrate.

Although some research has failed to incorporate vocalization and eye contact, these behaviors were found to be dominant in concurrent and sequential relations identified in the present investigation. In the concurrent combinations, 2,943 of the 3,658 occurrences involved vocalization or eye contact or both. In the sequential combinations, 439 of the 442 occurrences also included vocalization and/or eye contact.

Facial expression was the least occurring behavior, but the present data and evidence from other research (Bettencourt et al., 1983; Brigham, 1991; Frymier,1992; McKinney et al.,1984; Streeter, 1986; Wineburgh, 1990) indicate that facial expressions may be important. During this investigation, facial expressions were related to other enthusiasm behaviors, particularly eye contact and vocalization. Gesturing was an enthusiasm behavior that occurred frequently among the four outstanding instructors. It was, however, a behavior that rarely occurred alone. The data show that gesturing primarily occurred in conjunction with eye contact and vocalization. Gestures (in various combinations) also preceded movements and facial

expressions frequently. Movements (walking), unlike gestures, occurred often by themselves and appeared to be only slightly dependent on the occurrence of other behaviors. When concurrent combinations occurred, movements existed primarily with vocalization and eye contact. Movements most often were sequential predecessors to the occurrence of a facial expression or eye contact.

Teachers can be trained to recognize and emit enthusiastic behaviors to enhance the performance and engagement of their students (Bettencourt et al., 1983; Brigham, 1991; Frymier, 1992; Streeter, 1986; Waxman & Eash, 1983; Wineburgh, 1990). What concurrent and sequential occurrences would be desirable for teacher trainees to learn? Eye contact and vocalization were found to be present and dominant in both concurrent and sequential occurrences for the four outstanding instructors. The findings presented here concerning concurrent and sequential occurrences of facial expressions, gestures, and movements also provide preliminary guidance in defining the construct of enthusiasm as it may relate to teacher training. For example, it may be important to use enthusiasm behaviors as lead-ins for other enthusiasm behaviors to enhance the effect of the latter.

Despite the individual differences among the instructors, the same dominant patterns of enthusiasm behaviors were found across all four. It remains to be seen if these patterns hold with other settings (e.g., elementary and high school) or groups of instructors.

Annecdotally, "poor" teachers are often characterized as being distant with little animation or movement. The present research, however, did not seek to investigate the behaviors of "poor" instructors because of ethical and practical reasons related to subject recruitment. Although the picture is not complete, the model presented here for assessing concurrent and sequential occurrences may help to broaden the potential assessment and application of enthusiasm in teaching.

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Table 1

Behaviors Used in Assessing Teacher Enthusiasm Behaviors

	Voice	Eye Contact	Gesture	Moves Body	Facial Express	Word Choice	Accepts Ideas	Overall Energy	Praise	Humor	Commits to Topic
Bettencourt et al. (1983)	√	√	√	√	√	√	√	√			
Streeter (1986)	√	√	√	√	√	√	√	√			
Brigham (1991)	√	√	√	√	√	√	√	√			
McKinney et al. (1984)	√	√	√	√	√			√			
Wineburgh (1990)	√		√		√						
Frymier (1992)		√	√		√						
Payne & Manning (1986)						√	√		√		
Ware & Williams (1977)						√	√	√		√	
Weaver & Cottrell (1987)								√			√

Table 2

Sample Snapshot to Illustrate Scoring

	2-Second Intervals				
	2	4	6	8	10
Eye Contact (EC)	√	√	√		
Facial Expression (FE)		√	√	√	√
Vocalization (V)			√	√	√
Gesture (G)			√	√	
Movement (M)					

Table 3

Frequency of Concurrent Dependencies among Enthusiasm Behaviors

Concurrent Dependency	Subject One	Subject Two	Subject Three	Subject Four	Totals Low Count[a]	% Based on Low Count[b]	% Based on 1200 Total Intervals[c]
EC-FE[d]	42	25	41	69	177/183	96.7	14.7
EC-V	213	143	279	233	868/904	96	72.3
EC-G	159	104	247	216	726/796	91.2	60.5
EC-M	159	73	92	161	485/567	85.5	40.4
FE-V	43	29	41	65	178/183	97.2	14.8
FE-G	33	23	39	62	157/183	85.7	13
FE-M	27	11	6	37	81/183	44.2	6.7
V-G	175	131	255	220	781/798	97.8	65
V-M	191	132	101	154	578/667	86.6	48.1
G-M	122	62	81	148	413/593	69.6	34.4
EC-FE-V	41	25	41	65	172/183	93.9	14.3
EC-FE-G	33	21	39	62	155/183	84.6	12.9
EC-FE-M	25	8	6	37	76/183	41.5	6.3
EC-V-G	156	104	246	202	708/796	88.9	59
EC-V-M	156	66	93	141	456/651	70	38
EC-G-M	110	43	75	131	359/593	60.5	29.9
FE-V-G	33	22	39	58	152/183	83	12.6
FE-V-M	27	11	6	34	78/183	42.6	6.5
FE-G-M	19	6	6	33	64/183	34.9	5.3
V-G-M	122	60	81	142	405/593	68.2	33.7

table continues

EC-FE-V-G	32	20	39	58	149/183	81.4	12.4
EC-FE-V-M	24	8	6	34	72/183	39.3	6
EC-V-G-M	109	45	75	127	356/593	60	29.6
EC-FE-G-M	19	6	6	35	66/183	36	5.5
FE-V-G-M	19	6	6	32	63/183	34.4	5.2
EC-FE-V-G-M	19	6	6	32	63/183	34.4	5.2
TOTAL EC	218	154	280	267	919/1200		76.5
TOTAL FE	44	29	41	69	183/1200		15.2
TOTAL V	276	263	297	255	1091/1200		90.9
TOTAL G	176	133	255	234	798/1200		66.5
TOTAL M	219	164	102	182	667/1200		55.8

[a] Totals Low Count are ratios of the number of occurrences of that combination over the total possible in that combination based on the least occurring behavior in that combination per day.

[b] Percentage Based on Low Count is calculated using the ratio in the Totals Low Count column.

[c] Percentage Based on 1200 Total Intervals is calculated using the number of occurrences of that combination divided by the total number of possible occurrences (1200).

[d] EC=eye contact, FE=facial expression, V=vocalization, G=gesture, M=movement

Table 4

Frequency of Sequential Dependencies among Enthusiasm Behaviors

Preceded by	Focus Behavior	Subject One	Subject Two	Subject Three	Subject Four	Totals Ratio[a]	Percentage
Nothing	EC	3	0	0	1	4/79	5
FE[b]	EC	1	0	0	0	1/79	1.2
V	EC	8	6	4	1	19/79	24
G	EC	0	0	0	0	0/79	0
M	EC	2	0	1	2	5/79	6.3
FE-V	EC	0	0	0	0	0/79	0
FE-G	EC	0	0	0	0	0/79	0
FE-M	EC	0	0	0	0	0/79	0
V-G	EC	2	4	3	1	10/79	12.6
V-M	EC	7	7	2	1	17/79	21.5
G-M	EC	0	1	0	0	1/79	1.2
FE-V-G	EC	0	0	0	0	0/79	0
FE-V-M	EC	0	0	0	0	0/79	0
FE-G-M	EC	0	0	0	0	0/79	0
V-G-M	EC	4	8	1	9	22/79	27.8
FE-V-G-M	EC	0	0	0	0	0/79	0
Nothing	FE	1	0	0	0	1/100	1
EC	FE	0	0	1	1	2/100	2
V	FE	1	1	0	0	2/100	2
G	FE	0	0	0	0	0/100	0

table continues

M	FE	0	0	0	0	0/100	0
EC-V	FE	1	3	0	5	9/100	9
EC-G	FE	0	0	0	1	1/100	1
EC-M	FE	0	1	0	3	4/100	4
V-G	FE	0	0	2	0	2/100	2
V-M	FE	0	3	0	0	3/100	3
G-M	FE	0	0	0	0	0/100	0
EC-V-G	FE	6	4	15	7	32/100	32
EC-V-M	FE	6	0	0	0	6/100	6
EC-G-M	FE	0	0	0	0	0/100	0
V-G-M	FE	1	1	0	1	3/100	3
EC-V-G-M	FE	9	3	6	17	35/100	35
Nothing	V	5	2	0	0	7/48	14.5
EC	V	1	1	1	2	5/48	10.4
FE	V	1	0	0	0	1/48	2
G	V	0	0	0	0	0/48	0
M	V	3	6	1	2	12/48	25
EC-FE	V	0	0	0	0	0/48	0
EC-G	V	1	0	0	4	5/48	10.4
EC-M	V	1	6	0	9	16/48	33.3
FE-G	V	0	0	0	0	0/48	0
FE-M	V	0	0	0	0	0/48	0
G-M	V	0	1	0	0	1/48	2
EC-FE-G	V	0	0	0	0	0/48	0
EC-FE-M	V	0	0	0	0	0/48	0
EC-G-M	V	0	0	0	0	0/48	0

table continues

FE-G-M	V	0	0	0	0	0/48	0
EC-FE-G-M	V	0	0	0	1	1/48	2
Nothing	G	2	0	0	0	2/84	2.3
EC	G	1	0	1	2	4/84	4.7
FE	G	1	0	0	0	1/84	1.1
V	G	4	3	1	0	8/84	9.5
M	G	0	1	1	0	2/84	2.3
EC-FE	G	0	0	0	0	0/84	0
EC-V	G	2	4	7	9	22/84	26.1
EC-M	G	2	3	0	10	15/84	17.8
FE-V	G	0	0	0	0	0/84	0
FE-M	G	0	0	0	0	0/84	0
V-M	G	2	4	0	0	6/84	7.1
EC-FE-V	G	0	0	0	1	1/84	1.1
EC-FE-M	G	0	0	0	0	0/84	0
EC-V-M	G	7	8	5	3	23/84	27.3
FE-V-M	G	0	1	0	0	1/84	1.1
EC-FE-V-M	G	4	0	0	1	5/84	5.9
Nothing	M	5	1	1	1	8/125	6.4
EC	M	1	0	1	4	6/125	4.8
FE	M	0	0	0	0	0/125	0
V	M	9	11	5	1	26/125	20.8
G	M	0	0	0	0	0/125	0
EC-FE	M	0	0	0	0	0/125	0
EC-V	M	2	4	5	4	15/125	12

table continues

EC-G	M	0	0	0	4	4/125	3.2
FE-V	M	0	0	0	0	0/125	0
FE-G	M	0	0	0	0	0/125	0
V-G	M	1	0	1	0	2/125	1.6
EC-FE-V	M	0	0	0	0	0/125	0
EC-FE-G	M	0	0	0	0	0/125	0
EC-V-G	M	12	5	23	8	48/125	38.4
FE-V-G	M	0	0	0	0	0/125	0
EC-FE-V-G	M	4	2	4	6	16/125	12.8

[a] EC was initiated 79 times. FE was initiated 100 times. V was initiated 48 times. G was initiated 84 times. M was initiated 125 times.

[b] EC=eye contact, FE=facial expression, V=vocalizaiton, G=gesture, M=movement